Astronomy: Earth and Space Systems

8-4 The student will demonstrate an understanding of the characteristics, structure, and predictable motions of celestial bodies. (Earth Science)

8-4.1 Summarize the characteristics and movements of objects in the solar system (including planets, moons, asteroids, comets, and meteors).
Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/Future knowledge: Most of these objects in the solar system are being dealt with for the first time. Students in 4th grade (4-3.1) recalled that Earth is one of many planets in the solar system that orbit the Sun. Revolution and rotation as movements have also been studied (4-3.4, 5). In 4th grade (4-3.2), students compared the properties (including they type of surface and atmosphere) and the location of Earth to the Sun, which is a star, and the Moon. No other planets or moons have been studied. A complete study of the properties of the Moon that make it unique among other moons in the solar system is studied in high school Earth Science (ES-2.2).

It is essential for students to know that objects that are found in the *solar system* have characteristics based on surface features and atmosphere (if there is one). These objects have movement, usually some type of orbit/revolution and possibly rotation also.

Planets
- Planets may have a terrestrial or rocky surface or a gaseous surface. Gaseous planets are considerably larger than terrestrial planets.
- Planets may have rings. Some planets have a unique surface characteristic, for example color or an atmospheric storm.
- Movement of planets is based on revolution around the Sun and rotation on the planet's axis.

Moons
- Moons are studied in relation to the planet they orbit. Not all planets have moons.
- Most are rocky bodies covered with craters, but some have unique characteristics.
- Movement of moons is based on revolution around their planets.

Asteroids
- Most asteroids are rocky bodies that orbit in a region in the solar system known as the asteroid belt between Mars and Jupiter.
- They vary in size and shape.
- Movement is based on their revolution around the Sun.
- Some asteroids outside the asteroid belt have orbits that cross Earth's orbit; scientists monitor the positions of these asteroids.

Comets
- Comets have a main body or head (ices of water, methane and ammonia and dust) and a tail that emerges as the comet gets closer to the Sun during its orbit.
- The tail always points away from the Sun. Comets have unique long, narrow elliptical orbit.

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Meteoroids

- Meteoroids are chunks of rock that move about within the solar system.
- Location and movement result in the different terms:
  - Meteor – when the chunk of rock burns up in a planet's atmosphere; or
  - Meteorite – when the chunk of rock strikes the surface of a planet or moon.

It is not essential for students to know specific data about each planet, for example, exact distance from the Sun, time of revolution or rotation or the diameter. Students do not need to identify the names of or number of moons a planet has.

Assessment Guidelines:

The objective of this indicator is to *summarize* the characteristics and movements of objects in the solar system; therefore, the primary focus of assessment should be to generalize major points about characteristics and movements of planets, moons, asteroids, comets and meteors. However, appropriate assessments should also require students to *interpret* a diagram of the objects in the solar system; *compare* objects in the solar system; *classify* objects in the solar system based on characteristics; *classify* by sequencing planets in order from the Sun or by size; or *identify* an object in the solar system based on its unique characteristics or movements.